Engineering Library

MAR 7 1921

PUBLIC WORKS

CITY COUNTY STATE

GEORGETOWN BRIDGE PIERS FROM SOUTH ABUTMENT SHOWING CABLE-WAY AND ORIGINAL FLOATING CONCRETE PLANT.

The construction of this bridge will be described next week.

FEBRUARY 26, 1921

KOEHRING

The Paver of Low Mixing Cost

EVERY second of time saving means money saving—profit making on a paving job. The paver that is lowest in cubic yard mixing cost is the cheapest mixer. Any other is costly.

Extra Yardage Built In

Koehring mixers ***are designed*** to give the lowest mixing cost. Centralized control—the many automatic actions found only on Koehrings enable the operator to maintain that day after day speed of operation which means a big season's extra yardage.

Heavy Duty Construction

Heavy duty construction is but another term for dependability—and dependability pays a big extra profit in trouble free continuous operation—which means lowest mixing cost.

Koehring mixed concrete is dominant strength concrete.

Write For Koehring Paver Details

Koehring Low mix cost—dependability—can't be wished into a mixer. It must be built in. It is built into Koehrings. Investigate. Write for details of Koehring pavers.

Construction MIXERS

Capacities 28, 21, 14, 10, 7 and 4 cubic feet mixed concrete. Steam or gasoline.

Paving Mixers

Capacities 28, 21, 14 and 10 cubic feet mixed concrete. Boom and bucket system. Multiplane traction.

Hot Mixers

Capacity 14 cubic feet. Boom and bucket system. Multiplane traction.

KOEHRING MACHINE CO.
MILWAUKEE · · · WISCONSIN

PUBLIC WORKS.

CITY COUNTY STATE

A Combination of "MUNICIPAL JOURNAL" and "CONTRACTING"

Entered as Second-Class matter at the Post Office at Floral Park, N. Y., August 27, 1920, under the Act of March 3, 1879.

Vol. 50 FLORAL PARK, FEBRUARY 26, 1921 No. 9

Completing Germantown Dam

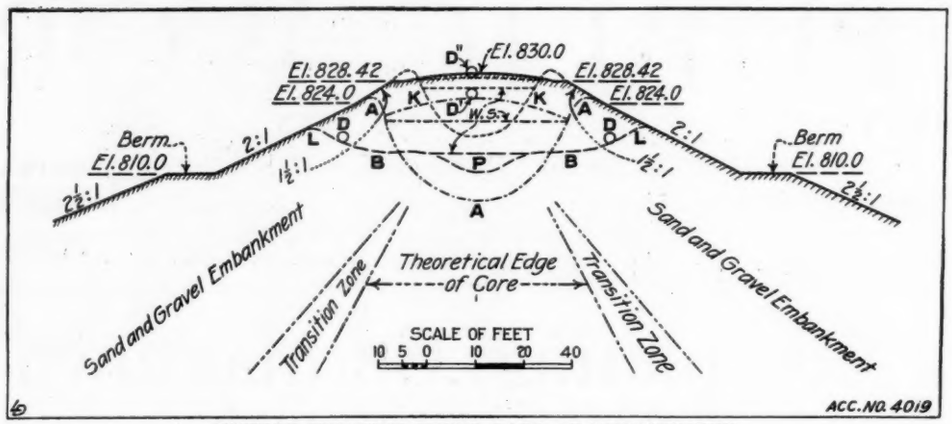
Top of 798,000-yard hydraulic fill 110 feet high placed by special method. Outlet conduits reduced to permanent cross sections. Spillway and paving finished and 20,000 yards of concrete placed in appurtenances.

GERMANTOWN DAM SUMMIT AFTER LAST DEPOSIT OF MATERIALS

This shows the result of the operation depicted on page 185. The dredge pipe is in the center. The ridges of sand and gravel at the edges are excess material to be used in final grading of the dam crest; which will be used as a highway, 25 feet wide.

The Germantown retarding dam is an important unit in the $25,000,000 construction undertaken by the Miami Conservancy District to prevent a recurrence of the disastrous Miami valley flood of 1913 which cost about 400 lives and $100,000,000 worth of property in Dayton, Hamilton and other Ohio towns.

The Germantown dam is built across Twin creek, a tributary of the Miami river, and is the smallest of five retarding dams being constructed by the district. It is 1,210 feet long on the crest, is 110 feet high above the bed of the stream, has a width of 25 feet on top where a roadway is constructed 25 feet above flood level, and has a spillway 10 feet above ordinary flood level. It has side slopes of 3:1, 2½:1 and 2:1, giving it an extreme width of about 700 feet at the bottom. The side slopes are interrupted by three berms. The dam is built entirely of earth embankment extending down into a full-length cut-off trench, excavated on the center line, and has appurtenances that, including the spillway and outlet tunnels, contain about 20,000 yards of concrete. Construction work was commenced by Conservancy forces June 30, 1918, the embankment was completed November 6, 1920, and the



LL are the levees; BB the beaches; P the pool at the stage when the embankment reached an elevation 15 feet below the top. The pool bottom was then scooped out and built into the levees, giving the section AAA. Hydraulic fill was then deposited to the line KK. A repetition of these operations brought the dam to its final elevation.

SECTION THROUGH UPPER PART OF EMBANKMENT

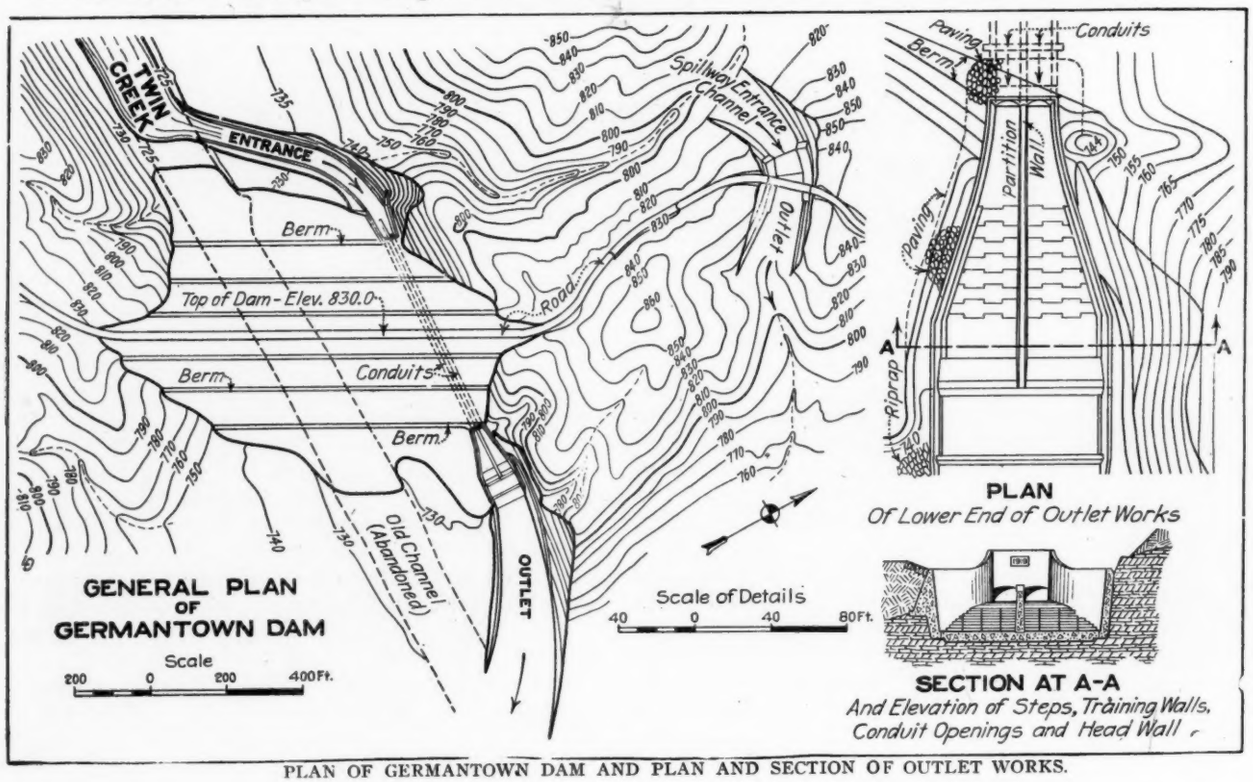
remainder of the work had been practically finished before January 1, 1921.

In a flood like that of 1913 the dam will impound 73,000 acre feet of water covering 2,950 acres and will discharge the water at a maximum rate of 9,340 second feet. The twin outlet conduits are 9 feet 1 inch high and 13 feet wide, and the spillway, located in rock on the hillside at one end of the dam, is 55 feet long on the crest.

PRELIMINARY AND AUXILIARY

Preliminary operations were commenced in April, 1918, by the construction of a camp with 23 cottages, 12 bunk houses, mess hall, store, warehouse, hospital and garage for a population of about 180. There was simultaneously commenced the installation of the construction plant, which included a Lidgerwood electric drag-line excavator with 100-foot boom and 2½-yard bucket, a Marion model 36 caterpillar drag-line excavator with a 40-foot boom and 1½-yard bucket, a Dull gravel washing and screening plant, a 1-yard Smith concrete mixer, standard and narrow-gauge cars, steam and gasoline locomotives, and a transformer sub-station and electric power line from the Dayton Light & Power Co.'s plant.

The excavation of about 105,000 yards of earth for the outlet conduits was commenced June 30, 1918, by the drag-line machine and the last of the 15,368 yards of concrete was placed May 10, 1919, the conduits then having a temporary height nearly twice as great as that of the finished structures, in order to provide ample outlet for possible floods. The concrete for the outlet conduits was made with sand and gravel excavated near the dam by a small Marion drag-line excavator and hauled in dump cars to the gravel washer. The concrete was delivered from the mixer to cars on a narrow-gauge service track terraced into the hillside, and was spouted into position



PLAN OF GERMANTOWN DAM AND PLAN AND SECTION OF OUTLET WORKS.

in the forms through chutes suspended from traveling trestles handling the conduit excavation and also used to handle the concrete forms.

During the construction of the outlet conduits the large drag-line excavator dug channels connecting the inlet and outlet ends of the conduit with the creek above and below the dam, and started work on the construction of the cross dam on the north end of the river, built by the plastic fill method, to retain the hydraulic fill deposited on the lower portion of the north end of the same dam.

The drag-line machine also excavated the cut-off trench for the main dam embankment, in which there was driven a row of interlocking steel sheet piles having a maximum penetration of 35 feet below trench bottom to bearing on solid rock.

The cut-off trench, 30 to 100 feet wide at the bottom, was excavated by the drag-line machine through 7 to 10 feet of loose rock, tripod drills were installed in the bottom of the trench and bored holes from 18 to 28 feet deep, which were loaded with ½ pound per yard of 40 per cent dynamite which, when fired, shattered the material sufficiently to be handled by the drag-line bucket.

SUPPLYING EMBANKMENT MATERIAL

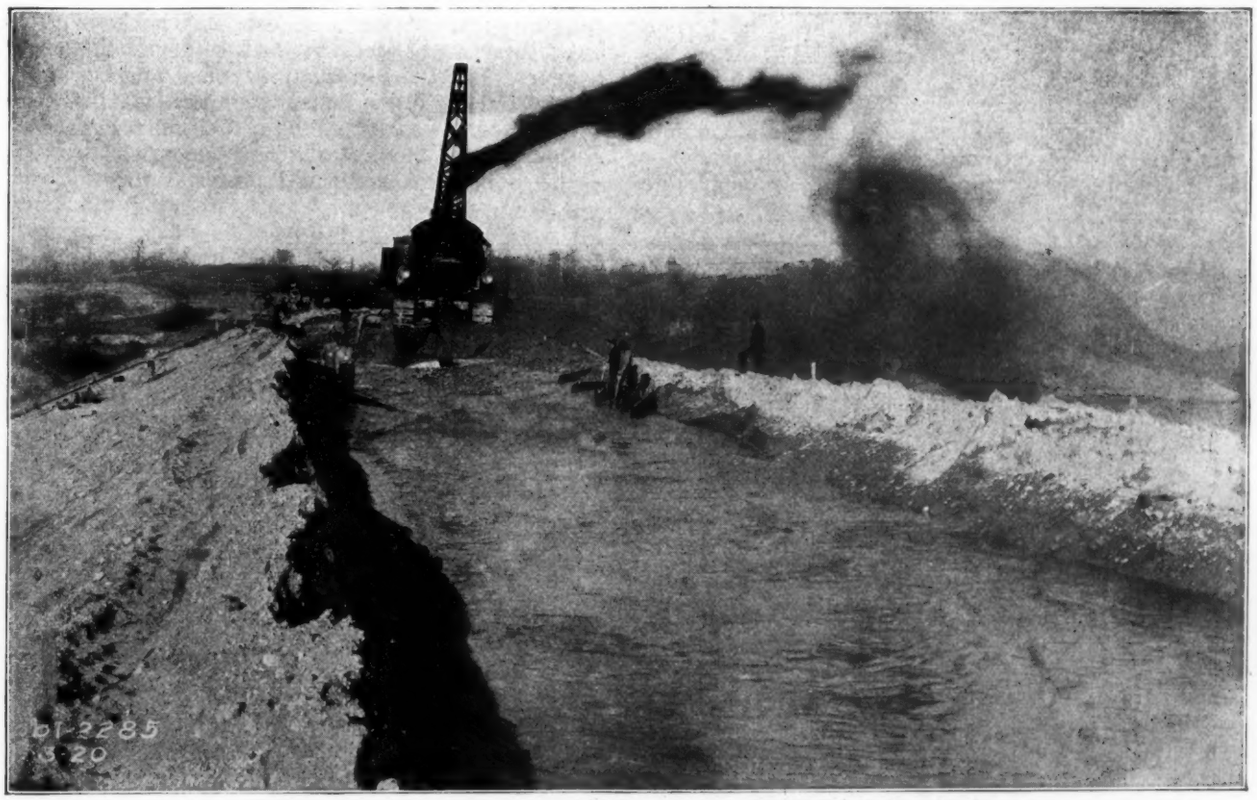
Material for the embankment was excavated, from the bottom of the valley near by, by the Lidgerwood drag-line machine and hauled to the pumping station by 12-yard standard gauge dump cars and steam dinkies. It was dumped alongside a hog box about 20 feet wide and 100 feet long with sheeted sides and a bottom sloping slightly to a drainage opening that covered the sump.

The spoil was washed into the hog box, as required, by two 3-inch 60-pound hydraulic jets, which were carefully operated to maintain the supply as uniformly as possible with the required proportion of water. The grating intercepted the oversize stone, and the small stones, gravel, mud and water passed through it into cylindrical screens in the sump which rejected any material that was too coarse, and passed the remainder through mixing hoppers supplying the suction pipes of two 15-inch electrically operated centrifugal pumps making 505 r. p. m. and handling about 7,000 gallons per minute, carrying from about 6 per cent to 20 per cent of solid material.

When the proportion of the solid matter in suspension is too small, the pumping is, of course, unnecessarily expensive, and when it is too great the discharge pipes soon become plugged, involving considerable delay and expense. Various devices were tried to prevent the plugging, and electric signals were arranged to notify the pump runner instantly of any decrease in the discharge at the end of the pipe, so that measures could be taken immediately to prevent the plugging.

PLACING HYDRAULIC FILL

After the dam site had been cleared and grubbed, a levee with a trapezoidal cross-section about 8 feet high was built by the drag-line machine along the upstream and downstream toes of the embankment, and a discharge pipe, with



TOPPING OUT THE GERMANTOWN DAM

Dragline machine excavating coarse material from the core pool to build up side levees to retain top stratum of "mud concrete."

the outlet supported on trestles about 4 feet above the surface, was carried along the full length of the inner slope of each levee and these were used alternately to avoid the time and expense of shifting a pipe from side to side of the dam as the latter was built up.

An opening in the bottom of the discharge pipe near the end permitted the larger stones to fall on the ground below, forming a conical heap over which the water, flowing in every direction, deposited the smaller stones and earth, soon building up to the bottom of the pipe, after which the end of the pipe was extended, another hole made in the bottom and so on, the materials carried by the water forming a flat slope inclined towards the longitudinal core of the dam with the coarser materials near the outside. The outer edges of the slopes were called beaches and between the beaches on the opposite sides of the dam formed by the two lines of hydraulic pipe there was an intermediate space where the water collected in a deep, narrow pool where the finer material held in suspension gradually settled to the bottom, making a core deposit of fine, soft silt.

After the beaches had been completed from one end of the dam to the other, levees were built by the drag-line machine of the coarse material on the outer edge and the operations were repeated as described in PUBLIC WORKS, May 15, page 419, until the dam had been built up to within about 15 feet of the top.

The slope of the beaches was determined by the size of the material suspended in the water, the coarser it was the steeper the slope. The width of the core was determined by the elevation at which the overflow of the pool was maintained, being greater the higher the elevation, thus enabling the proportion of core and outside materials to be varied at will.

The core was composed entirely of very fine material, averaging about 85 per cent clay and silt and 15 per cent of very fine sand. The core gradually hardened from the bottom up, as was indicated by frequent observations made by sounding with a 6-inch cast iron ball which settled through the soft mud until it stopped in the harder stratum.

The discharge pipes were extended section by section from one end of the dam to the other and then were shortened in reverse manner to the first end by gangs of 6 men handling the 16-foot lengths of pipe and operating the drag-line machine that built the levees in advance of the progress of the pipe.

INCREASING AMOUNT OF FINE MATERIAL

The material hauled from the bottom of the valleys to the hog box in dump cars, being found to be too coarse, was supplemented by finer material washed out of the side of the valley adjacent to and at a higher elevation than the hog box by hydraulic monitors, sluiced down the hillside directly into the sumps, not only increasing the quantity of material transported by a given amount of pumping, but reducing the friction in the pipes so that on this account and for other reasons the rate of pumping increased from 35,000 cubic yards in July to 91,500 yards in October.

SPECIAL METHOD FOR TOPPING DAM

When the dam had been built up to the dotted line LBPDL on the diagram, about 15 feet below the finished top, the discharge pipes were located at D, D on the inner slopes of the levees L L, and the width of the core pool having been reduced to about 15 feet, the sand and gravel began to encroach on the transition zones and on the core and the method of construction was modified by the elimination of the transition zones and the building of the remainder of the cross-section of the dam of mixed solid material forming a

When the pool had been nearly filled with earth by the dredge pipe, it was dug out down the center line by the drag-line excavator, creating the deep trench seen in the picture, the excavated materials being used to build up the sides of the trench still higher. This trench is then filled up as after the first stage, the dragline excavator following along just beind the discharge of the dredge pipe, and bringing the new surface to proper level by picking up with its bucket material from the pool, and depositing it where needed.

RESULT OF THIRD STAGE OF TOPPING OUT GERMANTOWN DAM.

homogeneous "mud concrete" rather than the separated strata of coarse, medium and very fine materials in the lower part of the dam. This has the advantage of providing a stiff, hard surface covering the still soft lower strata of the core and able to carry the highway there.

The Marion drag-line machines excavated on the center line of the dam, deepening the core pool and using the dredged material to build up levees on the sides, making the section line AAA. Both of the dredge pipes were removed from the outer faces of the dam and one pipe D′ was installed on the center line, discharging both fine and coarse material in the axis of the dam. Excavating machines working alongside built up new levees K K, the dredge pipe was shifted to the uppermost position D″, and the embankment was finally completed up to the sub-grade of the future highway, making the construction so solid and strong that it showed no signs of settlement under the 40-ton drag-line excavator.

COMPLETION OF OUTLET CONDUITS

After the dam had reached an advanced stage of completion, the extreme end of one of the outlet conduits was closed by vertical planks set against four horizontal 8 x 16-inch cross girders and faced with matched boards with chisel edges at the bottom driven to broom on the floor of the conduit and make a tight joint, excluding the water. The lower end of the conduit was closed by a dam 3½ feet high, made with bags of earth and gravel, and the 700,000 gallons of water between the bulkhead and dam were pumped out in 12 hours by a 6-inch centrifugal pump.

A concrete bulkhead 10 feet thick was then built filling the lower part of the conduit up to the level of the bottom of the floor of the finished conduit and a similar bulkhead 5 feet thick was built at the lower end; the space between these bulkheads was then filled with sand and gravel and on this the new concrete arched floor, 2 feet thick at the center and 4 feet thick at the sides, was laid from end to end of the conduit, thus reducing the depth from the original 22 feet 6⅛ inches to 10 feet 5⅜ inches. After the completion of this conduit the water was diverted to it from the other conduit, the second conduit was closed, and the bulkheads, filling and floor constructed as already described for the first conduit.

The dam was designed and built by the Miami Conservancy Commission, Arthur E. Morgan, chief engineer; Charles H. Hall, assistant chief engineer; E. H. Locher, construction manager; and A. L. Pauls, division engineer. The completion of the dam was described in several articles in the December issue of the "Miami Conservancy Bulletin," from which the accompanying illustrations are reprinted.

Highway Shade Trees in California

In spite of the increased expenses of highway construction, the State Highway Commission of California expects to adhere to the budget whereby $20,000,000 will be spent on roads uncompleted under the first two road bond issues and $20,000,000 for new roads. Preservation of redwoods along the state highway is recommended by the commission, and it has brought about a working agreement between the State Board of Forestry, the department of landscape gardening of the University of California and the Highway Commission whereby a plan for highway beautification will be prepared covering the entire state. The commission also advises convict labor, and says that three more convict camps are to be established and investigations made of the feasibility of establishing state cement plants.

Sewer Assessments in Newton

Increased last year to provide for increase in cost of sewer construction.

In his annual report for the year 1919, Edwin H. Rogers, city engineer of Newton, Mass., called attention to the constantly increasing cost of labor and materials used by the sewer department, as a result of which the city government considered the propriety of raising the sewer assessment rate and Mr. Rogers recommended to the Board of Aldermen that the rate be increased.

A revised ordinance adopted in 1915 had fixed the sewer assessment as a frontage assessment of $.20 per lineal foot and an area assessment of $.01 per square foot within 125 feet of a street or way. Since that time the city had built or ordered built a total of 10.97 miles of sewers at a total cost of $224,513, on which assessments had been or would be levied amounting to $97,316. The average length of sewer built during that five-year period was 2.2 miles, which agrees very closely with the average for the past 20 years, which has been 2.25 miles. The average cost per foot of the sewers built during the past five years has increased from $2.52 in 1915 and 1916 to $5.64 in 1919. The average for the period has been $3.88 per foot and the assessment $1.68 per foot.

Since 1914 the cost of vitrified sewer pipe has increased 75 per cent, brick 83 per cent, cast iron manhole frames and covers 133 per cent, cement 87 per cent and lumber 200 per cent. A general average of the materials was assumed at 100 per cent. In 1914 the city paid unskilled labor 28.1 cents per hour, and during the last quarter of 1919 paid 57.2 cents an hour, an increase of 104 per cent. The cost of a one-horse team without driver has increased from $2.40 per day to $4.

The average cost of the sewerage system of the town up to 1915 was $3.32 a lineal foot, while the cost of future construction was assumed at $7.57 provided present prices were not lowered. "Taking present and past costs into consideration and attempting to discount the future as far as practicable, with the possibility that in the immediate future the cost of doing construction work may increase rather than diminish, it is suggested that for the present the rate of sewer assessment be increased 50 per cent and be fixed at the rate

of 30 cents per lineal foot of frontage and 1½ cents per square foot of area within 125 feet from a street or way in which a sewer is located."

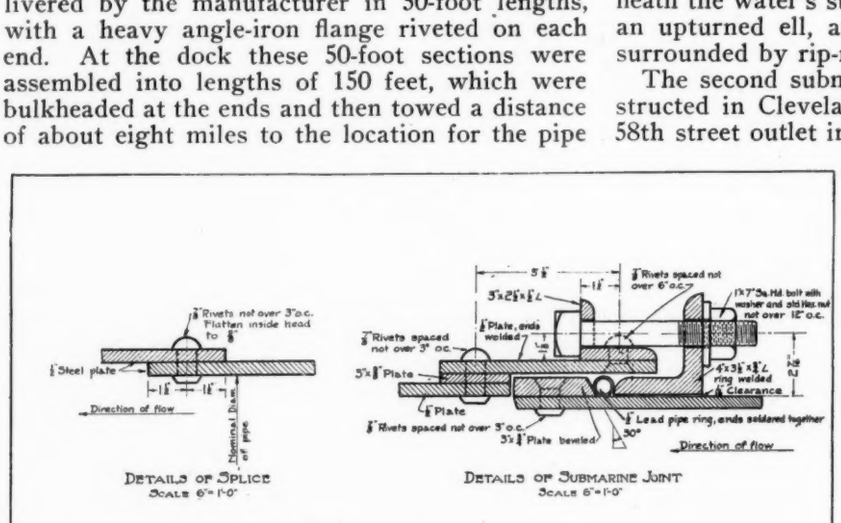
Several months after this recommendation was made, the Board of Aldermen increased the sewer assessment even more than was recommended, establishing the rate at 30 cents per lineal foot of frontage and 2 cents per square foot of area within 125 feet from the street or way in which the sewer is located. On corner lots it is customary to assess frontage on both streets and area on one street to a depth of 125 feet from each street, provided the land is drainable into the sewer. If, in any case, the land is not drainable to a distance of 125 feet, only so much of the land as is drainable is assessed. The drainage line is computed as the contour at which a house connection laid at a 2 per cent rate from the crown of the sewer and at right angles thereto would cut the surface of the land.

Cleveland's Submerged Sewage Outfalls

Cleveland, Ohio, and the district around it discharges about 100,000,000 gallons of sewage a day into Lake Erie, and it is estimated that by 1960 this will amount to 300,000,000. Cleveland's sewage is discharged through three long outlet lines at points less than a mile from large public bathing beaches, while one is approximately four miles from the present water works intakes. The construction of these outfall pipes and the conditions observed about the several submerged outlets were described by George B. Gascoigne and William L. Havens, respectively sanitary engineer and assistant sanitary engineer of the sub-division of Sewage Disposal of Cleveland, in "The Cornell Civil Engineer," which description, slightly abbreviated, is given below:

The first submerged outfall in Cleveland was placed in operation in 1912 at the East 140th street outlet and was designed to discharge at a single point about 2,600 feet off shore and in about 25 feet of water. This outlet pipe, 63 inches in diameter, was made of riveted steel boiler plate, dipped in a preservative coating as a protection against rust and acid. The pipe was delivered by the manufacturer in 50-foot lengths, with a heavy angle-iron flange riveted on each end. At the dock these 50-foot sections were assembled into lengths of 150 feet, which were bulkheaded at the ends and then towed a distance of about eight miles to the location for the pipe line. Openings were then made in the bulkheads and each section of pipe was allowed to fill slowly, gradually settling into its proper place. After the pipe had been lowered, a diver connected the 150-foot sections by means of a special submarine joint. The pipe was laid on an even grade in a trench excavated in the lake bottom and terminates in a single outlet approximately 25 feet beneath the water's surface. This outlet consists of an upturned ell, and is protected by a caisson surrounded by rip-rap.

The second submerged outfall pipe to be constructed in Cleveland was installed at the West 58th street outlet in 1916. The shore end of this pipe consists of 400 lineal feet of 72-inch concrete pipe with cast iron flanges, the pipe being carried on timbers between the piles supporting the storm overflow channel. At the end of this section there is a 72-inch by 60-inch by 60-inch cast iron Y and from one branch of this Y extends a 60-inch line of riveted steel pipe, 2,200 feet in length. The other 60-inch branch of the Y was bulkheaded and provides for the future installation of a similar pipe line. From the end of the 60-inch line there extends 1,000 feet of steel pipe tapering gradually from 60 inches to 24 inches in


Rivets not over 3" o.c. Flatten inside head to
Steel plate
Direction of flow
Nominal Diam. of pipe
Details of Splice
Scale 6"=1'-0"
Rivets spaced not over 6" o.c.
Plate, ends welded
Rivets spaced not over 3" o.c.
Plate
Rivets spaced not over 3" o.c.
Plate beveled
Lead pipe ring, ends soldered together
30°
Direction of flow
Clearance
Details of Submarine Joint
Scale 6"=1'-0"
Welded rings
Bolts with Std. washer not over 6" o.c.
Wood gasket made up of two segments nailed together
Rivets not over 3" o.c. Flatten inside head to
Details of Flange Joint
Scale 6"=1'-0"

DETAILS OF 63-INCH RIVETED STEEL PIPE

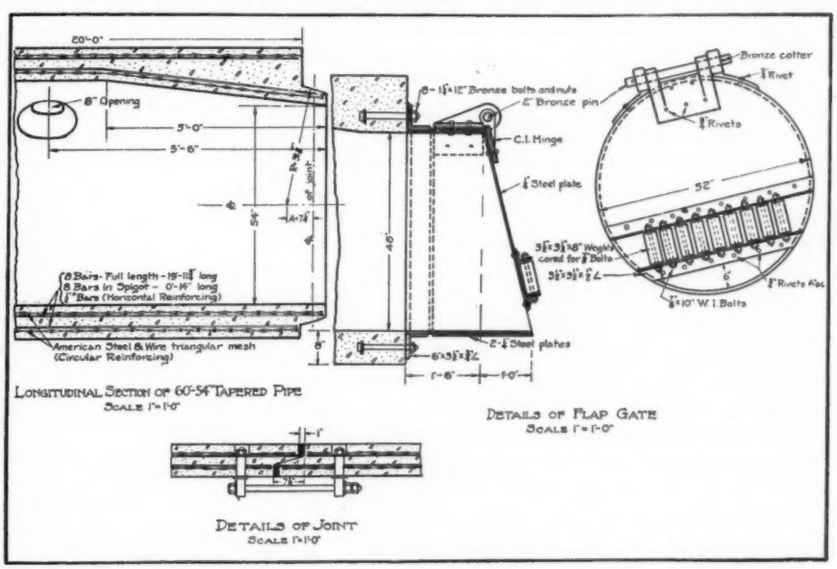
diameter and along this tapered section are openings 6¾ inches in diameter, staggered on 7½-foot centers. This pipe was laid in a trench excavated in the lake bottom and terminates in a cast iron flap gate, so weighted as to insure maximum use of the multiple outlets, under all conditions of flow. The average depth of the openings beneath the water's surface is approximately 30 feet.

The third submerged outlet to be constructed was completed in 1918 and was laid in a trench parallel to and approximately 150 feet distant from the steel pipe installed at the easterly site in 1912. This pipe is 84 inches in diameter and was made of reinforced concrete having a wall thickness of 8 inches. The pipe was cast in 20-foot lengths, each section weighing approximately 25 tons. A concrete bell and spigot, cast to a hemispherical curve, was formed on the ends of each pipe by the use of cast iron forms specially machined. These castings were placed in the bottom of the pipe forms and the concrete of the pipe shell poured upon them. Two holes were left in the concrete about 8 inches from each end of the pipe, into which were later wedged eye-bolts which were bolted together after the pipe was in place. The 20-foot sections were cast on end in steel forms.

After the concrete had hardened sufficiently, the 20-foot sections were turned on side, loaded upon scows and towed a distance of about ten miles to the outlet trench. Each section was lowered in place by means of an A-frame so mounted that it could be swung out over the end of the scow and from which the pipe was suspended in double loops of cable. As soon as the trench had been excavated to grade, the pipe was lowered and the directions for moving it in order to engage with the spigot end of the pipe already in place, were telephoned by a diver to his attendant on the scow. In order to maintain a uniform grade for the pipe line it was often found necessary to support an end of a pipe on concrete blocking or to remove obstructions in the trench by means of a water jet handled by the diver. When the pipe had been brought to correct line and grade, the diver inserted 1¼-inch tie bolts about 4 feet long through the eye bolts on either side of the pipe line and these bolts were tightened by means of a ratchet wrench, hand-operated from a float. Each joint was inspected by the diver and in cases where oakum was used, the joint was caulked from the inside before another pipe was lowered in place.

The total length of this concrete submerged out is 3,200 feet, of which the last one thousand feet consists of a section tapering from 84 inches to 48 inches in diameter. Along this tapered section there are 150 8-inch openings staggered on 6½-foot centers, the axes of the openings being upturned 45 degrees with the horizontal. These portholes were cast in the pipe by means of wooden forms, the concrete being carefully finished to obtain a smooth round orifice. The depth beneath the water's surface of the several points of discharge averages approximately 30 feet. The pipe was laid on an even grade in a trench excavated in the lake bottom and terminates in a 48-inch flap gate so designed as to remain closed except when the flow of sewage exceeds the capacity of the multiple outlets along the tapered section.

The substitution of concrete for steel in the construction of the second submerged outlet at the easterly site was not made as the result of any superior qualities of the materials as such, but was rather a measure of economy and expediency. At the time the second pipe line was proposed (1917) steel in any form was difficult to obtain and consequently the price bid per lineal foot for steel was approximately twice that submitted for the equivalent size of concrete pipe. In regard to the relative merits of the two materials, specific requirements and specific handling and laying facilities would no doubt be the deciding factors in nearly every installation, provided conditions were such that prices were at all comparable. While with ordinary precautions observed in laying either type of pipe, the flanged joint used for steel pipe will probably result in less leakage than the bell and spigot joint used for concrete, it should be emphasized that the importance of this factor would depend upon the use and location of the pipe line. It is safe to assume that the concrete bell and spigot pipe would not ordinarily be suitable for a high pressure line although the actual leakage on this particular pipe amounted to slightly less than one



DETAILS OF REINFORCED CONCRETE PIPE AND SUBMARINE JOINT

cubic foot per minute per joint, when tested under six feet of static head. The difference in durability of the two materials would probably be negligible except in the case of sewage carrying an exceedingly high percentage of acid industrial wastes. Another advantage in the use of concrete lies in the carrying capacities of the two pipes and especially is this true if steel forms are used and care is exercised in the making and pouring of the concrete. It may be said, however, that due to the greater weight of the concrete pipe and to the consequent difficulties in handling and laying the heavier sections, a given length of submerged steel pipe can usually be laid in a shorter time. This is due not only to the extra number of joints which must be made below water, but also to the amount of time required for hauling the sections to the site of the work.

ALLOWABLE LEAKAGE FOR SUBMERGED OUTFALLS

It is to be appreciated that absolute water-tightness in a submerged sewer outfall is not so necessary as in the case of pipe lines used for other purposes such as submerged water supply intakes or land sections of water or sewer pipe lines. However, in order that the general intent of preventing sewage solids from being stranded upon the bathing beaches and of obtaining a continuous pipe line of reasonable tightness may be carried out, it is usually customary to include in the specifications an item which states the maximum allowable leakage. This amount, of course, varies with the material used, the method of laying and the type of joint and is ordinarily expressed in cubic feet per minute per joint when the entire pipe line is tested under a specified static head. The leakage in the 400 feet of 2-inch concrete and 2,200 feet of 60-inch steel pipe installed at the West 58th street outlet, as actually measured under test, amounted to practically one-quarter of a cubic foot per minute per joint when the line was subjected to a 6-foot head. The leakage in the 84-inch concrete pipe installed at the East 140th street outlet amounted, under similar conditions, to approximately one cubic foot per minute per joint. As soon as the construction of the approach channels leading to the outfall pipe were completed and the last section of 84-inch pipe, containing a tight timber bulkhead, was laid, the flow of sewage was utilized to build up the static head on the pipe line. The quantity of sewage entering the approach channels was regulated and measured so that, for any given head, the total leakage was known. In order to cause a leakage of one cubic foot per minute when tested under six feet of head, a single opening of only about one-half inch in diameter would be required. As mentioned above, while this leakage might prove excessive under certain conditions, yet it is believed that this amount, if evenly distributed along the entire length and not confined to a certain few joints of a submerged sewer outfall, will not be objectionable and may be obtained under average working conditions, with either steel or concrete pipe. The experience in Cleveland demonstrates that submarine pipe joints can be made sufficiently tight without the use of cast iron flanges.

TYPE OF OUTLET AT POINT OF DISCHARGE

Since thorough dispersion of the sewage is to be desired in order to obtain the full benefits of the diluting water, considerable study has been given to the most practical manner in which this result could be obtained. From studies of the various Cleveland installations it is evident that the multiple outlet has a decided advantage, especially in relatively shallow depths. The exact location of the single point of discharge of the easterly steel pipe line is easily determined since the disturbance on the water's surface is so marked that when the lake is calm the boiling effect can be seen from shore. In the case of the multiple outlet section, however, it is practically impossible to note any disturbance of the water's surface even from a boat near the outlet. The taper of the pipe is so designed that maximum use is always made of the portholes along the tapered section. Under maximum flow conditions, the flap gate at the end of the tapered section is forced open and then receives its share of the total flow. Assuming that conditions of operation are the same as calculated in the design and that each opening receives its proportion of the total flow, the discharge from each porthole (under an average total flow of 75 m. g. d.) amounts to approximately 0.5 m. g. d. This rate of flow from points some 30 feet below the lake level is not noticeable at the water's surface and such an arrangement must obviously result in more effective dispersion than would be the case if the entire quantity of sewage were discharged at a single point.

CONDITIONS ABOUT SUBMERGED OUTLETS

The first observations of conditions about the outlets were made in 1913 after the 63-inch steel pipe at the easterly site had been in operation about one year. Soundings around this outlet indicated that a carpet of sludge had formed upon the lake bottom to a maximum depth of about two feet and that this deposit was fairly well distributed over an area within a radius of from 100 feet to 300 feet from the point of discharge. After the multiple outlet pipe at the westerly site had been in operation only a few days dredgings were made in this vicinity by dragging a conical iron scoop along the lake bottom, but no evidence of a deposit of sludge was obtained. Six months later, however, masses of sludge varying in size from a few inches to some thirty or forty feet in diameter were seen to rise to the surface of the water in the vicinity of this outlet. These masses disintegrated readily on coming to the surface and either settled again as soon as the gas was liberated or else were scattered in fine particles throughout the lake water. Similar conditions have since been observed about the steel pipe outlet at East 140th street. Dredgings have shown the presence of a carpet of sludge extending as far as one-quarter of a mile from the point of discharge. This condition was particularly noticeable during the excavation of the trench for the concrete pipe which paralleled the former pipe

line and was distant from it about 150 feet. Large masses of sludge were removed by the clam-shell or rose to the surface as adjacent layers were disturbed. The material itself is a black foul mass frequently containing large quantities of long thread-like worms. It has the characteristic odor of decomposing sludge and is usually filled with minute bubbles of gas. It has been observed that most of the gas-lifted sludge may be found after a comparatively long period of warm weather during which time the lake has been very calm. As a rule after heavy storms very little of the material will be noticed in the vicinity of the outlets.

While particles of solid matter from sewage, such as matches, hulls of grain, vegetables, seeds and pieces of soap have been found scattered along the shore of the lake for a distance of perhaps two miles from the easterly outlet, this condition has usually occurred during or just after high sewage flows when the excess storm water has been discharged directly upon the beach. The degree to which this condition will obtain, now that provision has been made to discharge the excess flows 600 feet off shore, is a matter for continued observation. There is no doubt, however, that, under certain conditions, particles from the sewage discharged at the outlets do find their way to the shore. Floating material recognizable as of sewage origin may be noticed in the water about either outlet, the quantity gradually diminishing with increasing distance from the outlet but being readily visible for a distance of from one to two miles. After prevailing westerly or northwesterly winds such particles have been observed at Euclid Beach, a distance of approximately one and one-half miles from the easterly outlet. Seagulls have also been seen taking food from the water as far distant as this point. The same conditions obtain in respect to Edgewater Beach at the westerly site but to a lesser degree on account of the direction of the natural lake currents and of the prevailing winds.

The discoloration of the lake water about the easterly steel outlet can, on a clear day, be easily seen from shore and usually occupies an area about one-half mile in width and from two to three miles in length, gradually diminishing in intensity toward the limits of this area. While the area about the West 58th street multiple outlet appears more turbid than the surrounding lake water, this sewage field cannot ordinarily be noticed from shore. The discoloration probably does no particular harm; nevertheless, it has its sentimental effect upon residents along the lake front in continually reminding them of the presence of sewage in the lake water.

The presence of sleek and oily areas about the outlets is probably visible only from boats in the immediate vicinity and is not noticeable from shore.

Throughout the observations very little notice has been made of odors about the outlets except the stale sewage odor which may be traced quite a distance from the point of discharge, particularly in the direction of the sewage polluted area. Septic odors are noticeable only during warm weather when masses of the sludge are being gas-lifted.

It is believed that the discharge of crude sewage into the lake through any type of outlet will result in the formation of a sludge carpet upon the lake bottom, and that the effect of sewage treatment in reducing the extent of such carpet will depend upon the quantity of sewage solids removed by the treatment processes. Due to the distribution of these solids through a multiple outlet, the thickness of the mat formed should be decreased and hence the tendency of the material to rise to the surface in large masses should be diminished. While smaller masses may be gas-lifted they will be less likely to find their way to shore but will be more easily scattered through the lake water. Under like conditions it is believed that no appreciable difference in the amount of solids stranded upon the bathing beaches will be noticed in the use of the two types of outlet. The multiple outlet should, however, reduce considerably the intensity of the discolored area as well as the odors in the immediate vicinity of the point of discharge.

GENERAL

Robert Hoffman is chief engineer and commissioner of the Division of Engineering and Construction, of which the Sub-division of Sewage Disposal is a part. The work of design and construction herein described was under the supervision of George B. Gascoigne. A. C. Lucas and William L. Havens were the resident engineers in immediate charge of construction and the Great Lakes Dredge & Dock Company and the American Construction Company, both of Cleveland, were the contractors for the westerly and easterly concrete outfalls, respectively.

Building the Du Pont Boulevard

Construction by State Highway Department of 5-mile section of 96-mile, $4,000,000 concrete highway presented by General du Pont. Aggregate from elevated bins at central storage yards, delivered in batch boxes hauled by locomotives on narrow gage service track. Thorough surface finish.

The du Pont boulevard, which traverses the state of Delaware from north to south, forming the backbone of the state highway system of improved roads will, when completed, have cost about $4,000,000 and will be the present to the state by General Coleman du Pont, who, as an individual, commenced its construction several years ago and after the organization of the State Highway Department transferred the work to it in order that it should conform with their standards and methods, although the entire cost is paid by himself.

This section of the road, 5 miles long, is under construction by the Piel Construction Co. of Baltimore, and consists of a standard concrete pavement 16 feet wide, 6 and 8 inches thick, with shoulders 8 feet wide on each side. About two miles of the road follows the alignment of the old highway while the remainder is on an entirely new location eliminating former bends and curves. It passes through a sandy, cultivated country where it will serve as a main thoroughfare for through traffic and for adjacent towns and villages reached by transverse roads, many of which will eventually be improved. The road bed required very little grading; where the location was on old macadam the surface of the old road was loosened by a scarifier and plows and removed to sub-grade, which in all parts was thoroughly cleaned and compacted to receive the concrete pavement.

A steel shod template, operated by 4 men, was used to strike off the sub-grade to the exact depth. This was dragged along the side forms and produced a very uniform, smooth sub-grade for receiving the concrete.

Broken stone imported from Port Deposit was hauled about 3 miles from the railroad track by motor trucks that dumped through a platform trap to the boot of a bucket elevator filling a 20 x 20 x 10-foot elevated storage bin, adjacent to which there was a smaller bin of about half that capacity, with four bottom gates about 8 feet above the service track.

A train consisting of seven steel cars, each carrying two ½-yard wooden boxes, was spotted under the stone bin, the boxes were filled up to the gauge marks and the train hauled by a 24-inch gauge Plymouth gasoline locomotive to the sand storage pile, where sand was shoveled in up to the second gauge marks, and the train proceeded to the cement house of 4,000-bag capacity, where cement was added to each box and the train hauled to the mixer over the tracks laid on the sub-grade of the 8-foot shoulder of the road.

The surface of the concrete pavement was finished by special heavy steel screeds made with a 10-inch channel with a horizontal web and the flanges turned up. The channel was curved to a 2-inch crown and was reinforced the whole length by a 3 x 3-inch angle riveted on the center line of the web. Inclined steel handles were riveted to each end of the screed, which weighed 400 pounds and was operated by two men, producing a very smooth, uniform surface.

The batch boxes were unloaded by a derrick attached to and operated by the Austin cube power loading concrete mixer which swung them over the charging hopper into which their contents were emptied by tripping the side latch that retained the bottom flap of the box.

The concrete surface was compacted by a 6-foot Ransome hand roller and was finally dressed with a 12-inch belt attached to the end of an arched 12 x ¾-inch board that kept it tightly stretched and made it more easily and efficiently handled.

The finished surface was protected from the sun by immediately covering with canvas stretched over 6 x 16-foot frames made of 2 x 4-inch wooden strips. The second day the canvas covers were advanced to protect the fresh concrete and the concrete thus exposed was covered by 2 inches of earth spread over it and kept wet for 14 days. The earth was kept in position for 16 days after the sprinkling ceased.

Water for sprinkling, for the concrete mixing and for other purposes was pumped from the pit where the sand was excavated and washed. The work was commenced in May and finished in November for a contract price of $232,000.

Alarming Deterioration of New York Transportation Lines

Public Service Commissioner Alfred M. Barrett, speaking of local surface traction lines in New York and vicinity says that their present dilapidated conditions due to lack of maintenance funds are such that the cost of putting them in first class condition will very soon approximate the cost of buying entire new equipment on virtually all of the lines operating in Queens County and some in other boroughs.

He says that the aspect is alarming, and that unless there is an improvement soon there will be an increase in the number of accidents and a decrease in service. The estimated amount of the deferred maintenance has increased more than $4,000,000 to the present total of nearly $7,000,000 in eighteen principal companies, five of which are now in the hands of receivers, besides six other companies also in receivership that together operate 700 of the 1,000 miles operated in the city of Greater New York. Ten important lines or systems have ceased operation chiefly because they could not pay expenses.

Farther disorganization is caused by the suits for more than $9,000,000 construction claims that have been brought by thirteen contracting companies, besides which litigation for $1,750,000 damages to buildings and adjacent property is also in progress.

Building Permits and Contracts in 1920

Statistics throughout the United States gathered by the Southern Pine Association show that permits were issued in principal cities during 1920 for all classes of buildings a value of $4,527,245,933, whereas actual construction was undertaken upon permits amounting to only $2,564,582,000. A decrease in the amount of residence construction in comparison with all construction is also shown, only $565,931,000, or 22 per cent, was for residences. This compares with $2,579,800,000 total construction during 1919, which included $849,206,000, or 32 per cent, of residences.

That more money will be available for building is indicated by the action of the real estate committee of the board of directors of the Metropolitan Life Insurance Company, in authorizing loans for 160 buildings, aggregating $2,081,950 and distributed throughout fifteen states. Fifty million dollars is held by the company for this purpose.

PUBLIC WORKS

Published Weekly
by
Municipal Journal and Engineer, Inc.
Publication Office, Floral Park, N. Y.
Advertising and Editorial Offices at 243 W. 39th St.,
New York, N. Y.

Subscription Rates
United States and Possessions, Mexico and Cuba....$3.00 per year
All other countries .....$4.00 per year

Change of Address
Subscribers are requested to notify us promptly of change of address, giving both old and new addresses.

Telephone (New York): Bryant 9591
Western office: Monadnock Block, Chicago

A. PRESCOTT FOLWELL, Editor
FRANK W. SKINNER, Associate Editor

CONTENTS

COMPLETING GERMANTOWN DAM—Illustrated 183
Highway Shade Trees in California 187
SEWER ASSESSMENTS IN NEWTON 187
CLEVELAND'S SUBMERGED SEWAGE OUTFALLS—Illustrated 188
BUILDING THE DU PONT BOULEVARD..... 191
Alarming Deteroiration of New York Transportation Lines 192
Building Permits and Contracts in 1920 192
EDITORIAL NOTES 193
Snow Handling Apparatus—Municipal Utilities and Political Boundaries—Important Development of Construction Methods
Municipal Development of Hydro-Electric Power.... 194
Large Increase of Lumber Sales 194
Building Permits and Contracts in 1920 194
1921 Street Work in Topeka 194
Road Traffic Census in Pennsylvania 194
PAVEMENT LAID DURING 1920—Table 195
HOW TO UNJOINT AND HANDLE THREE MILES OF LEAD-JOINT, SMALL-SIZE CAST IRON PIPE? 197
Boston Needs More Water 198
Trade Schools Necessary for the Building Industry.. 198
RECENT LEGAL DECISIONS 199

Snow Handling Apparatus

The storm of February 19 gave New York City a chance to use its million dollars' worth of snow handling apparatus to advantage. The main avenues were cleaned of the fourteen-inch fall in record time, so far as the surface tracks were concerned, there having been very little delay of the street railways.

In removing the snow, however, there seems to have been much less improvement; the loading of trucks and carts by hand has been favored by the warm weather, but is progressing slowly except along the water fronts. Moreover, most of the side streets have not been opened up at all, and the gutters are not cleared for handling a rain or thaw. It is evident that snow loaders or some other contrivances for removing the snow are needed to fully meet the snow problem in cities, where there is no unused space for piling the snow, as there is in country roads. There seems also to be a need for some appliance for cleaning out a narrow channel for gutters, probably traveling on the sidewalks and discharging into the roadway. The trying out and improving of appliances for removal is now the pressing problem.

Municipal Utilities and Political Boundaries

The necessity of disregarding political boundaries where they conflict with physical ones in the developing of municipal utilities such as water supply, sewerage, etc., approaches the critical stage as the population of a district becomes more dense. This is illustrated by the metropolitan district surrounding New York City, which includes a part of New Jersey and Connecticut as well as the southeastern corner of New York state, including Long Island.

At the convention of the American Society of Civil Engineers, New York section, Morris R. Sherrerd, chief engineer of the Department of Streets and Public Improvements of Newark, suggested that a joint commission be created representing New York, New Jersey and Connecticut with power to disregard state lines in the administration of water supplies; while Dr. George A. Soper suggested the formation of a separate state embracing much the same area, for solving the sanitary conditions of this metropolitan district, especially sewage disposal and water supply.

Mr. Sherrerd stated that the district in New Jersey is increasing in population at approximately 4 per cent per year and the water consumption somewhat more rapidly, so that during the past 20 years the water consumption of the city of Newark has doubled notwithstanding the fact that 98 per cent of the services of the city are metered. He believed that the formation of such a commission as was suggested is inevitable when it is considered that there now exists or will exist in the near future the necessity of reciprocity in such matters among these states, and also between New Jersey and Pennsylvania along their mutual boundary.

Important Development of Construction Methods

The substantial completion of one of the five flood protection dams, built by the Miami Conservancy Commission in the Miami valley, not only signalizes the creation of an important safeguard against serious dangers, but it also notably illustrates the successful application of the hydraulic transportation principle to the efficient and economical construction of great earth dams, the elimination of a large amount of hand labor, and the substitution of large units of simple and powerful construction apparatus for a more varied, extensive and costly installation of different types of plant that are likely to be operated with less co-ordination and greater expense and liability to accident and interruption.

The able analysis and co-ordination of princi-

ples, conditions and requirements has defined the practical limits and indicated the character of the general operations, and the details of construction have been so intelligently adapted that remarkable efficiency, rapidity and economy have been attained in a little-known type of important construction, and valuable precedents have been established.

Municipal Development of Hydro-Electric Power

The officers and advisory committee of the New York State Conference of Mayors and Other City Officials have presented to the governor and legislature of New York State a legislative program covering a considerable number of features, among these being one dealing with the securing of hydraulic power rights for the municipalities of the state. The federal hydro-electric power bill recently enacted gives preference to states and municipalities in the application for preliminary permits for boundary waters and for federal waters for the generation of hydro-electric power for municipilaties. The city council of Buffalo some time ago directed the corporation council to apply for such permit in connection with Niagara river. Other cities so situated as to be able to take advantage of this preference are urged to do so and the legislature is requested to enact such legislation as may be necessary to empower and aid the cities in obtaining these water rights.

Large Increase of Lumber Sales

A large increase in the demand for lumber is shown by the Trade Barometer of the Southern Pine Association. During the week ending January 14, 136 mills reported orders received totaling 3,163 cars, or 68 million feet. This is the largest amount of business received in any week during the past nine months. the previous higher mark being in April, 1920.

Production of Southern pine is still reaching new low levels. Last week's output was the lowest of any similar week during the past six years and was 48 per cent below normal. Orders received during the week were 40 per cent more than the actual production. Of 78 mills reporting operating time, 22 operated full time, 20 were closed down entirely, and the others operated on various degrees of reduced time.

Ohio's New Highway Commissioner

Governor Davis has appointed Leon C. Herrick as state highway commissioner, succeeding A. R. Taylor. It is reported that Mr. Herrick is to reorganize the state highway department in conformity with recommendations to be made by Gen. George W. Goethals, who recently surveyed the department here at the request of Gov. Davis.

Mr. Herrick is a member of the Ohio Engineering Society and has had eighteen years' experience in engineering, including two years as assistant city engineer of Mansfield, city engineer of Norwalk and thirteen years in the office of the surveyor of Huron county.

Street Paving in Chicago

The Department of Public Works and members of the Council of Chicago have practically decided upon a repaving program covering 50 miles of streets on which there will be spent in 1921 approximately $5,000,000. The first step has been taken in advertising for bids for 7 miles of highways estimated to cost about $700,000. Council has appropriated $1,000,000 in the annual budget for the repaving work, with the idea that this would be replaced by a part of the $5,000,000 which it is expected to raise by short-term repaving loan, when this shall have been approved by the legislature.

1921 Street Work in Topeka

Topeka, Kan., plans to spend about $500,000 for street improvements in 1921—the largest sum expended by the city in six years. Of this amount more than $300,000 is to be spent for paving and about $200,000 for sewers, bridges and other street work. Petitions are being circulated for paving about 100 blocks and it is hoped to pave 70 or 80 of these during the year. W. E. Baldry, city engineer, has been engaged for several weeks in preparing plans for a $25,000 concrete bridge for carrying street cars as well as other highway traffic.

Street Commissioner W. S. Hancock reports that the equipment is on hand for beginning this work as soon as the weather is favorable. During the past year he has purchased an asphalt plant and two trucks and has on hand $6,000 worth of asphalt and several carloads of stone and fine aggregate.

Road Traffic Census in Pennsylvania

The state highway department of Pennsylvania during 1920 took a census of road traffic on a number of highways of the state and has just made public the figures obtained.

Figures were obtained in a two weeks' census on the Lincoln highway between Philadelphia and Trenton which indicated that a total of 773,604 tons traveled over the highway last year, giving a ton mileage of 10,830,456. It is estimated that this would have required 275 freight trains of 40-ton steel hopper cars. Commercial vehicles comprised 56 per cent of the traffic on this road.

On the Lincoln highway, 56 per cent of the tonnage is carried by trucks, of which 45 per cent were 5-ton, 16 per cent 1-ton, with the balance nearly evenly divided between 2, 3 and 4-ton trucks. The large-truck tonnage is due chiefly to the number of 5-ton trucks traveling on through freight routes as part of a regular long-distance freight service.

On route 34, between Harrisburg and Carlisle, which is water-bound macadam, 63 per cent of the traffic was passenger vehicles on a ton mileage basis, or 81 per cent by number of vehicles. Of the trucks passing over this route, about 28 per cent were 1-ton, about 24 per cent 2-ton, about 18 per cent 3-ton, about 15 per cent 4-ton and about 13 per cent 5-ton. By tonnage, however,

the 5-ton trucks led, with the tonnage decreasing in regular order through the 4, 3 and 2-ton to the 1-ton trucks, which carried about 11 per cent of the tonnage.

A road leading north from Altoona used extensively for hauling coal shows 86 per cent of the ton mileage carried by trucks, the greatest number of trucks and also the greatest tonnage being of 3-ton trucks, with 4-ton trucks making a close second. Over this route, only about 3 per cent of the trucks were 1-ton while about 13 per cent were 6-ton trucks.

It was found that truck traffic was a minimum between 11 p. m. and 1 a. m. and a maximum between 7 and 8 a. m. and 4 and 5 p.m.; also that the heaviest passenger car traffic was between 4 and 7 p. m., although considerable numbers were counted between 10 a. m. and 3 p. m.

PAVEMENT LAID DURING 1920

(Quantities are square yards or miles unless otherwise indicated)

Cities and States	Tar Macadam	Amiesite	Granite or other Stone Block	Brick or Clay Block	Creosoted Wood Block	Concrete Reinforced	Concrete not Reinforced	Plain (water-bound) Macadam	Gravel	Cement Sidewalks
Alabama:										
Andalusia							18,000*			
Montgomery							45,378*		77,400	
Arizona:										
Bisbee							50,000			58,514§
Arkansas:										
Ft. Smith										1
Little Rock								3		2¼
California:										
Bakersfield							2,635			28,315
Calexico										1
Napa							12,580			1,800
Palo Alto										1,500
San Francisco				12,850			11,160			10,596
Santa Monica							4,716			2,333
Colorado:										
Denver							91,711			
Connecticut:										
Bristol							2,600†			26,000§
Hartford			1,000					38,800		5
Manchester								9,000		3
New Haven							29,033.5	7,500		42,890§
Putnam							2,000			
Delaware:										
Lewes							0.94			4,000§
District of Columbia:										
Washington							53,884	43,148		34,022
Florida:										
Jacksonville				77,320						
Orlando				67,800						
Sanford										15,000§
Georgia:										
Albany				12,000						
East Point										3
Idaho:										
Boise									2	52
Idaho Falls										13
Nampa										20,000§
Rupert										370,000§
Illinois:										
Centralia						17,316				
Champaign						5,846				4**
Chicago			720	40,728	5,072		3,455			
Danville				1.69††						2
Galesburg				5,806						
Geneva				6,000		13,000				
Joliet				17,700						40,000§§
Kankakee				2,500						
Marion	7,900			14,000			13,500		3,500	112,000§
Murphysboro				20,000						60,000§
Ottawa						2,000				
Spring Valley									2	1
Streator										50,000§
Taylorville										600§§
Waukegan										1,700§
Winnetka							1,200			10,000b
Indiana:										
Covington										550§
Crown Point	100							1,000		500§
Ellwood							16,784			330
Elkhart				2,450						
Fort Wayne							1,348			23,171
Gary	22,776.8					39,797.54	9,116.79			4,500
Greenfield									6	
Huntington										11,000§
Jennings								1.06	2.65	
La Porte				5,101						
Lafayette				33,317		7,289	1,714		10,300	5,626§§
Peru							45			
South Bend							1,270			95,192§
Terre Haute				4,433			3,092		1	1.6
Iowa:										
Adair				21,750			700			
Boone									2	3
Cedar Falls				7,645						
Cedar Rapids				6,817.09			9,994.49			
Charles City										10,000§
Cherokee							3,382			
Correctionville							30,000			
Davenport	10,239									
Emmetsburg										14,900§

PAVEMENT LAID DURING 1930 (Continued)

Cities and States	Tar Macadam	Amiesite	Granite or other Stone Block	Brick or Clay Block	Creosoted Wood Block	Concrete Reinforced	Concrete not Reinforced	Plain (water-bound) Macadam	Gravel	Cement Sidewalks
Iowa (Continued)										
Fort Dodge							667			31,000§
Garner						50,000				
Mason City						25,000				
Muscatine							10,362.51			
Tabor				22,000			200			
Villisca				3,140			1,570			
Kansas:										
Dodge City				52,500						
Fort Scott				1,000						
Hutchinson				90,000						
Independence				3						
Manhattan										1
Osawatomie							2,872			
Ottawa				¾						½
Wichita				110,810			54,598			
Winfield				5½			1a	1,500§§		1
Kentucky:										
Ashland	2,000			433						
Maysville										3,000§
Newport			1,200			3,000		15,000		
Louisiana:										
Crowley									10	28,000§
Minden				6,000						
Maine:										
Bangor			2,000				5,000			200
Gardiner									¾	
Norway							1			
Portland			3,196.91	1,252.22						2,224.41
Paris							1			
Rockland			526							23
Westbrook				475						
Maryland:										
Hagerstown			3,000							3,000
Massachusetts:										
Arlington	4,452.2						4,678.7			9,844.5§
Andover	1¼									
Athol									5,200§§	1,700§§
Attelboro									2	400
Boston			14,581	6,928	21,786					5,344
Braintree	¼									
Brockton			840	5,652					642,370	
Brookline	40,000							6,000		
Chicopee				11,570			9,072			1,720
Easthampton	3,500								½	600
Lee									2½	500
Lexington	19,093.5									45
Lynn	55,178		19,745				14,835			1,818
Millbury							½			
Orange									1	1,100
Pittsfield				3,300			9,872			2,858
Somerville	3.5		8,100							3,521
Spencer	2.500								3,000	
Wakefield									11,000	1,100
Waltham								20,000		
Watertown							18,316			43,472
Michigan:										
Ann Arbor				16,000			550		50,000	3,055b
Crystal Falls								7,872		1,229
Detroit			½				1,000		2	25,000§
Dowagiac										
Flint										350,000§
Grand Haven							1			
Ironwood	10.700									16,000§
Jackson				5,000						5
Lansing				2,000			1,720			3
Muskegon				3,000						
Sturgis										4,000b
Three Rivers							6,000§§		1	2,800§§
Minnesota:										
Albert Lea				3,000					1	
Cloquet									1	10,000§
Faribault						8,700		3		
Laverne							7,000			
Minneapolis				12,615	94,171		19,618			28
St. Paul				17,519	15,156		6,215			44,000
St. Peter	5.8									
Virginia						11,000				
Winona										48,000§
Mississippi:										
Canton									500§§	
Clarksdale									10,000	1,200
Laurel							700		2	
Missouri:										
Carthage							700			
Fredericktown									1¼	200§§
Fulton									3,000	4,000§
Sedalia				2,000						2
St. Charles	16,896			3,000					1,000	
Montana:										
Great Falls							6,300			
Lewistown						35,286				
Nebraska:										
Lincoln				14,328			659			161,831§§
Omaha				19,600		14,300	20,400			22,700§
Nevada:										
Reno							2,445			5.3
New Hampshire:										
Portsmouth									5	2,000§§

¶—Information furnished by manufacturers. *—Vibrolithic. †—Cubic yards. §—Square feet. ‡—7000 Topeka on stone base; 3000 on concrete base. **—5 ft. wide. ††—5381 lineal feet, 30 ft. wide, asphalt filler; 3572 lin feet, sand filler. —Feet. a—Blocks. b—Lineal feet. c—Dollars.

Construction Questions Answered

Suggestions as to methods, "wrinkles" and appliances that may be used to overcome difficulties arising in construction work. We invite questions concerning such problems that may arise from time to time in the experience of any of our readers. Answers prepared by competent authorities will be published promptly. It is hoped that ohters who have solved similar problems different will send us their solutions for publication also; or describe new "wrinkles." If it is only a new way to drive a nail, it may help some one.

How to Unjoint and Handle Three Miles of Lead Joint, Small Size Cast Iron Pipe?

Excavate trench, exposing pipe completely; separate into convenient lengths by melting lead in joints; lift pipe to surface by shear legs and tackles or by jacking and melt out remaining joints with blow torch or cut out lead with machine.

January 29, 1921.

Editor, PUBLIC WORKS.
Dear Sir:

We notice in your publication, PUBLIC WORKS, that construction questions are answered and request that you give us some information as to the best method of unjointing and handling about 3 miles of cast iron pipe of sizes from 4 to 12 inches. Lead was used for all joints and trenches in which pipe is laid are about 5½ feet in depth. If you have any statistics on the cost of same would like to have them.

Yours very truly,
GENERAL CONTRACTOR AND BUILDER.

Unjointing cast iron bell and spigot pipes is an easy and comparatively simple and inexpensive matter for moderate size pipes laid in accessible dry trenches. Under ordinary conditions unjointing is quickly accomplished and the principal elements are time and cost of excavating the trench and back-filling it.

If the work can be done continuously and most of the line is unobstructed, and the character of the soil is adapted for it, it will pay to excavate the trench down close to the top of the pipe by one of several efficient trenching machines on the market which will uncover several hundred feet of pipe daily under favorable conditions and at a small cost as compared with ordinary hand labor. In unfavorable soil on steep grades, or in crowded city streets, it will probably be necessary to do all of the work by hand.

UNJOINTING ON SURFACE

If the soil is dry and firm and the trench may be opened for long distances without requiring sheeting or pumping, the 4-inch pipe may be unjointed at one point in the trench and one end of it hoisted to the surface of the ground, supported on a cross-piece spanning the trench, and the remainder of the pipe successively lifted to and supported to the same elevation by jacking and cribbing, or preferably by hoisting tackles operated from shearlegs spanning the trench and advanced from point to point as the pipe is elevated, without disconnecting additional joints in the trench.

As the size and weight of the pipe increases it will become too heavy to be handled in long lengths and too stiff to be bent into the inclined position, and it will be necessary to unjoint the pipe in the trench at shorter and shorter distances, thus dividing it into sections of three pipe lengths or more, each of which can be hoisted to the surface by any convenient method, probably that of shearlegs and hand windlasses, and there supported on skids for blocking while the remaining joints are opened. It will, of course, be more expeditious, convenient and economical, to open as many of the joints as possible on the surface of the ground and as few as possible in the trench.

UNJOINTING IN TRENCH

After the excavation of the trench has been carried by the machine, if one is used, as close as possible to the pipe, the remainder of the excavation must be made by hand, and at those joints which are to be broken in the trench the excavations must be enlarged around the bells of the pipe so as to provide access to all parts of them. The lead must then be melted out of these joints and the pipes separated, thus permitting them to be disengaged and one piece of the pipe to be hoisted to the surface.

Ordinarily the lead can be rapidly and satisfactorily melted by the use of a blow torch burning gasoline or kerosene, which is operated under air pressure and directs the flame to any given point of the joint, thus concentrating the heat and quickly melting the lead without injuring or disturbing the pipe coating except at the point of application of the flame.

A pan or other suitable receptacle should be placed under the pipe joint and the melting commenced on top of the pipe, so that the melted lead may retain the heat and promote the rapidity of work as the torch moves on down the sides, to the bottom, completing the joint. Two men with a torch should be able to open from thirty to forty joints per day on small-size pipes. Torches suitable for this purpose are manufactured and sold by the Hauck Manufacturing Company, 126 Crescent street, Brooklyn, N. Y., and by W. J. McLeod, Cincinnati, O.

If such torches are not available, it is practicable to melt out the joint lead by means of open fires built around the joints. The fires may be made from refuse wood or with coke which lights easily and burns well in open places, giving an

intense heat. The joints should be entirely covered, top, bottom and sides, with the fuel and care should be taken to save the melted lead.

UNJOINTING WITH MACHINE

After the pipe is elevated to the surface of the ground the intermediate joints may be melted out exactly the same as in the trench, or it may be possible to open them by the use of a pipe-cutting machine, some types of which are equipped with a cutting tool that moves around and around the pipe projecting into the space between the bell and spigot and gradually planing out the lead caulking. These machines can be more easily applied to the pipe after it is elevated on blocks or trestles than when in the trench. Cutting machines are generally possessed by the water departments of cities and large towns and may be purchased from the A. P. Smith Manufacturing Company, East Orange, N. J.; the Merrill Manufacturing Company, Toledo; the Williams Tool Company, Erie, Pa.; and from Curtis & Curtis Company, Bridgeport, Conn.

TRENCHING AND BACK-FILLING MACHINES

If conditions are favorable for the use of a trenching machine to excavate for the pipe removal they would probably be equally advantageous for back-filling the trench by machinery. This can be accomplished by various machines on the market that are specially designed for this purpose or some other machines already in the contractor's equipment that may be utilized to less advantage if they are not otherwise employed, as, for instance, a very light steam shovel or a plow or scraper hauled by motor truck or tractor. The most suitable plant, however, is some type of locomotive drag-line machine.

Trenching machines are manufactured by the Buckeye Traction Ditcher Company, Findlay, O., and both trenching machines and back-filling machines are manufactured by the Austin Machinery Corporation, Railway Exchange building, Chicago, and by Pawling & Hanischfeger, Milwaukee.

Boston Needs More Water

The chief engineer of the state department of health of Massachusetts, X. H. Goodnough, testified recently before the Committee on Water Supply of the State Legislature that the Boston Metropolitan District will begin to experience a shortage of water within the next five years unless steps are taken immediately to increase the supply. He urged the construction of a reservoir to be located at Enfield and to draw water from the water sheds of the Ware and Swift rivers, which would have a capacity exceeding that of the Wachusett reservoir and would cost at least $50,000,000. He stated that the population of the Metropolitan district has doubled in 30 years and is still increasing at the same rate and that it will be only two or three years before the consumption equals the total resources of the present reservoirs at Wachusett, Sudbury and Framingham, and Lake Cochituate, which latter is now in reserve. The city of Worcester has asked to be admitted to the Metropolitan water district as it has nearly reached the end of its water capacity; while Waltham, Newton and Brookline will soon be in a similar situation.

Mr. Goodnough said that "in 1920 we had the wettest year in the last 25 or 30. We have had a cycle of wet years. This wet season runs about 15 years. Within a very few years we will have a dry season and the places which depend upon the rivers for their supplies will be in a serious situation unless we prepare now to meet the situation."

Trade Schools Necessary for the Building Industry

The special Senate Committee on reconstruction and production, William M. Calder, chairman, has issued to the press a statement that his recent investigation and nation-wide survey of the housing situation of the country, including a questionnaire to every city and village in the United States, shows that the most important problem facing the nation to-day is that of obtaining sufficient skilled workmen in the building trade.

Senator Calder has therefore addressed to the governor of every state in the Union a letter urging the establishment of trade schools, in which he says, in part:

One of the outstanding factors which is now hampering the building industry is the curtailment at the source of the supply of skilled tradesmen. The building industry is more highly organized than any other large industry but it is noticeable everywhere that its members are now getting along in years and in some trades the skilled young man is a rarity.

It has been the experience of the past that the skilled mechanic in the building trades drops out very much earlier than in other trades and is forced to take up other less skilful employment. His pay has accordingly been somewhat higher than the usual run but the necessity for constant replacement has been ever present.

The American youth takes kindly to the particular trades which require a little more skill than the others, and so we find among the electricians, the plumbers and the masons numerous young men of American birth, but such is not the case with the other trades.

Heretofore, men from foreign shores, dissatisfied with the political and social conditions existing in their fatherland, have come to this country and, without serving a technical apprenticeship, they have started at the bottom of the ladder in the building trades. Those who have been worthy have risen to heights limited only by their ability. The country was a huge industrial training school where the building trades were taught largely to newcomers to our shores but the ravages of war cut off this source of supply and the result is apparent on every hand.

The remedy seems plain—more apprentices. This goes to the essence, for without apprentices we shall soon be short of journeymen not only, but of foremen and practical employers. The problem is—How shall this be achieved? The best solution seems to be through the fostering of building trades schools. Some of the states have, under their labor codes, authorized a State Industrial Commission to operate an Apprentice Department. . . .

Summarizing the above, I solicit your good offices in promoting the replacement of the fast dwindling supply of building tradesmen through an adequate system of trade schools which shall be conducted along lines mentioned above, and I request that you at your early convenient give me the benefit of your counsel as to what has been done in your state along this line or what you believe can be done.

Very truly yours,
(Signed) WILLIAM M. CALDER,
Chairman.

Recent Legal Decisions

CITY FIREMEN NOT WITHIN PUBLIC WORKS EIGHT-HOUR DAY LAW

The California Supreme Court holds, Danielson v. City of Bakersfield, 193 Pac. 242, that a fireman, member of a paid fire department maintained by a municipal corporation, is not a laborer, workman or mechanic within the meaning of provisions in the State Constitution and statutes that the time of service of all laborers, workmen or mechanics employed upon any public works by the state, a county, or a municipality, is eight hours only.

ACTION ON PUBLIC WORKS CONTRACTOR'S BOND MUST BE BROUGHT WITHIN STATUTORY TIME

Kansas Civil Code, Section 662, provides that no action shall be brought on a public works contractor's bond after 6 months from the completion of the public improvement. The Kansas Supreme Court holds, Dickey v. United States Fidelity, etc., Co., 193 Pac. 346, that an action on such a bond which is not commenced until after 6 months from the completion of the work, although begun within 6 months after its acceptance by the municipal authorities, is barred by the statute. Acceptance might have been delayed by various causes which would not have delayed the time of completion.

COMPENSATION FOR INJURY TO EMPLOYEE TRANSFERRED TO SPECIAL EMPLOYMENT

The Wisconsin Supreme Court holds, Cayll v. Industrial Commission, 179 N. W. 771, that where an excavation contractor's employee consented to be transferred to the service of a gas company which was laying pipes in the ditches dug by the contractor, and was injured while working for the gas company, and under its control, the gas company, and not the contractor, was liable for compensation under the Workmen's Compensation Act; he having become an employee of the gas company under an implied contract of employment though he continued to work for the contractor one hour a day and was continued on his pay roll.

ACCUMULATION OF SNOW AND ICE ON SIDEWALKS

The Minnesota Supreme Court, following Smith v. City of Cloquet, 120 Minn. 50, 139 N. W. 141, holds, in McManus v. City of Duluth, 179 N. W. 906, that while mere slipperiness from the accumulation of snow and ice upon a sidewalk does not create a liability for injuries received in consequence thereof, yet there may be a liability where the municipality negligently permits an accumulation of snow and ice to such an extent, and to remain for such a length of time, that slippery and dangerous ridges and irregularities are formed therein from travel thereon, or other causes, thus rendering the walk unsafe and dangerous for public use.

SUBCONTRACTOR'S RIGHTS MEASURED BY VOIDABLE CONTRACT

A contractor for bridge construction with the city of Seattle without the consent of the city council sublet certain excavation work, so that the sub-contract was voidable by either party any time before such consent was obtained. The subcontractor abandoned the work when it was approximately half done and when it had been paid slightly more than half the contract price. The Washington Supreme Court holds, Dyer Bros., etc., Iron Works v. Pederson, 192 Pac. 1002, that the contract, though voidable, measured the compensation to which the sub-contractor was entitled, and it could recover nothing more from the contractor.

MUNICIPALLY OWNED WATER WORKS NOT SUBJECT TO EXECUTION

In an action against the Town of Lausalio, California, the sole question was whether the municipally owned water works of the town and its so-called franchise for supplying water to its people could be made the subject of levy and sale upon execution issued on a money judgment obtained against the municipality. The California District Court of Appeals, First District, in Marin Water and Power Co. v. Town of Lausalito, 193 Pac. 294, answered the question in the negative for the following reason: While it may be conceded that the grant to a private corporation of the right to exercise such a function as that of supplying water to a body of customers for a consideration in the way of tolls would be a franchise under the accepted definition of that term, the court does not think that definition is to be extended to similar powers and activities when these are being exercised by a public corporation by virtue of the powers possessed by it under the Constitution and Laws of the state. Nor can it be rightly extended to such powers and functions when exercised by a public corporation within the domain of its sovereign and under the authority and powers with which it is invested as such public corporation by the Constitution and Laws of the state, and sections 388 and 389 of the California Civil Code, providing for the sale of franchises under execution, has no application to such public uses.

In denying a rehearing of the case the California Supreme Court holds that the fact that the town is a public corporation does not determine the question whether or not its property is subject to execution. The true rule is that the property which it holds for the purpose of exercising its governmental powers or for the purpose of exercising its constitutional power to operate water works to supply its inhabitants with water or other like public purposes is not subject to execution; the reason being that to subject it to sale would interfere with the exercise by the city of some of the powers for which it was organized.

NEWS OF THE SOCIETIES

Feb. 28 — CHICAGO SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

March 1—INDIANAPOLIS CHAPTER, AMERICAN ASSOCIATION OF ENGINEERS.

March 1—CLEVELAND SECTION AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Cleveland Engineering Society rooms.

March 2—MINNESOTA SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. St. Paul Association. Open forum meeting.

March 4—METROPOLITAN SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Robert Treat Hote', Newark, N. J.

NEW ENGLAND WATER WORKS ASSOCIATION. March meeting, Copley Square Hotel, Boston. Secretary, Frank J. Gifford, Dedham, Mass.

March 11 — ROCHESTER (N .Y.) ENGINEERING SOCIETY.

March 11—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Engineering Societies Building, New York City.

March 11-12 — NORTHWESTERN ASSOCIATION OF GENERAL CONTRACTORS. St. Paul Hotel, St. Paul, Minn.

March 14—AMERICAN ASSOCIATION OF ENGINEERS. The third annual railroad conference. Chicago.

March 15-17 — AMERICAN RAILWAY ENGINEERING ASSOCIATION. Chicago.

March 18—SCHENECTADY SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

March 23-24—AMERICAN WATER WORKS ASSOCIATION. Illinois Section. Annual meeting, Chicago, C. C. Habermeyer, Secretary, Urbana, Ill.

March 30—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Directors' meeting. Atlanta, Ga. Secretary, James T. Mulcahey, Yonkers, N. Y.

Apr. 8—ROCHESTER (N. Y.) ENGINEERING.

April 16—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Joint meeting with the Association of Iron and Steel Electrical Engineers. Pittsburgh, Pa.

April 18-23 — UNITED STATES GOOD ROADS ASSOCIATION. Greensboro, N. C.

April 21-22—BANKHEAD NATIONAL HIGHWAY ASSOCIATION. 5th annual convention. Greensboro, N. C. Secretary, J. A. Routree, Birmingham, Ala.

April 27—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual convention. Houston, Texas.

April 27-29—UNITED STATES CHAMBER OF COMMERCE. 9th annual meeting. Atlantic City, N. J.

May 9-11—AMERICAN ASSOCIATION OF ENGINEERS. 7th annual convention. Buffalo.

May 9-12 — SOUTH-WEST WATER WORKS ASSOCIATION. Oklahoma City. Headquarters Skirvin Hotel.

May 17-19—NATIONAL FIREMEN'S ASSOCIATION. Twenty-third annual convention. Fort Wayne ,Ind.

June—CONFERENCE OF MAYORS AND OTHER CITY OFFICIALS, State of N. Y. 12th Annual Conference. Elmira, N. Y.

June 6-10—AMERICAN WATER TER WORKS ASSOCIATION. Annual convention at Cleveland, Ohio. Secretary, J. M. Diven, 153 West 71st St., New York.

June 7-9—NATIONAL FIRE PROTECTION ASSOCIATION. Annual meeting. San Francisco, Cal.

Oct., 1921—IOWA SECTION, AMERICAN WATER WORKS ASSOCIATION. Seventh annual meeting.

AMERICAN ENGINEERING COUNCIL

Lawrence Wilkerson Wallace was elected secretary of American Engineering Council at the meeting of the executive board in Syracuse, N. Y., on February 14, succeeding L. P. Alford, of New York, who has been acting secretary since the formation of the council in Washington on November 19, 1920. Mr. Wallace has been one of the most active figures in the council and from the time it was organized has been its treasurer. As vice-chairman of the council Mr. Wallace has been directing the work of the committee on Elimination of waste in industry, one of the principal committees of the council whose scope following the Syracuse meeting will be greatly broadened.

Mr. Wallace, now at the temporary headquarters of the council in the Engineering Societies' building, New York City, will soon transfer his activities to Washington, where the council has established permanent national headquarters in the McLachlen building. The Employment Service Bureau will be continued in New York, where Walter V. Brown is in charge.

The council, at the Syracuse meeting, gave formal approval to the action of the committee on procedure requesting that President Harding put an engineer on the Interstate Commerce Commission. The procedure committee was authorized to name six qualified engineers when requested to do so. Activity in behalf of a National Department of Public Works will be continued by the council through the Public Affairs Committee. It was recommended that engineering efforts be extended to the whole question of government reorganization planned under a special congressional committee.

The plan for the registration of engineers as presented in the council's report was endorsed and the appointment of another committee was authorized. The Russian Affairs Committee was made a new committee on International Relations, the personnel of the old committee being retained.

An invitation from Philadelphia engineers to hold the April meeting in that city was accepted. The June meeting will be held in St. Louis.

The council decided to recommend to President Harding that an engineer be appointed assistant secretary of war. No action was taken relative to the National Civic Federation, Fuel Conservation, or Merchant Marine Committee appointments. The Committee on Public Affairs was authorized to recommend the congressional appropriation to investigate deeper waterways—St. Lawrence project.

THE NEW ENGLAND WATER WORKS ASSOCIATION

The March meeting of this association will be held at Copley Square Hotel, Boston, March 9.

Program: 11 a. m., meeting of the executive committee at the headquarters, Tremont Temple. 1 p. m., lunch will be served at Copley Square Hotel. 2 p. m., papers, "Pipe Extension Charges," by Nicholas S. Hill, Jr., consulting engineer, New York City. "Cast Iron Pipe, the Method of Manufacture and Its Inspection," by William R. Conard, consulting engineer, Burlington, N. J., illustrated.

AMERICAN ROAD BUILDERS ASSOCIATION

The annual meeting and exhibition of this society was held at Chicago on February 9-12. A large attendance was present, and all joined in the discussion of technical papers, showing a lively interest which made the convention highly successful. And the exhibition of equipment and materials was excellent, notable both for its size and variety.

At sessions devoted to sub-grade design and research, probably the highest point of interest was reached. Important speakers on this subject were H. G. Shirley, F. H. Eno and Clifford Older. H. C. Sylvester, Jr., presented a paper on highway finance which was given great importance. W. A. Rogers, R. G. Collins and A. R. Hirst then addressed the meeting on the subject of contractual relations.

The chief business of the meeting was the presentation and discussion of resolutions. No formal action was taken as to the place of the next meeting, but Chicago was favored because of its central location.

COLORADO SOCIETY OF ENGINEERS

At its annual meeting on January 19, the Colorado Society of Engineers elected the following officers: President, F. C. Dreher; vice-president, R. M. Hosea; secretary, C. M. Lightburn. The following addresses were given: "Engineers' Problem of the West," by Fred. J. Lucas; "Transportation," by John Crook; and "Engineers' License Law," by Senator Walter O'Brien.

PROVIDENCE ENGINEERING SOCIETY

This society at its fifth annual banquet on February 1 was addressed by Professor William J. Cunningham on "Federal Control of Railroads." Arthur P. Russell, vice-president of the N. Y., N. H. & Hartford R. R., also discussed the subject.

JAMESTOWN ENGINEERING SO-

The Jamestown Enginering Society was organized at a recent meeting with the following officers: President, Walter F. Shaw; vice-president, E. C. Dollard; secretary, H. G. Garlock, and treasurer, F. A. Irvine.

UNITED ENGINEERING SOCIETY

The United Engineering Society, New York, at its annual meeting held on January 27, elected the following officers: President, J. Vipond Davies; first vice-president, Calvert Townley; second vice-president, W. L. Saunders; secretary, Alfred D. Flinn; treasurer, Joseph Struthers; assistant treasurer, George H. Pegram.

IOWA ENGINEERING SOCIETY

The directors of the Iowa Engineering Society have elected Lloyd A. Canfield of Des Moines secretary-treasurer to succeed John H. Dunlap, who was chosen president at the annual meeting on January 20.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

STAMP MIXER LOADER FOR CONCRETE HIGHWAY WORK

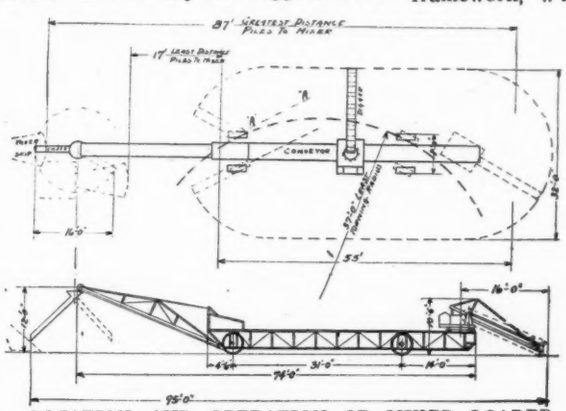
The Stamp mixer loader, manufactured by the Stamp Machine Co., picks up sand and stone from ground storage piles, measures them to exact proportions and conveys them in measured batches to the mixer. It is suitable where material is dumped on the subgrade, or where the material is piled at stations or intersections. On building work it takes the place of costly overhead bins and devices. It consists primarily of a long, longitudinal, structural framework, mounted on self-propelled truck wheels with the rear end inclined upwardly. A rubber belt conveyor of standard design is mounted in the lower part of this steel framework. This runs continuously and material dropped on to same is carried at a speed of 400 feet per minute and discharged into the mixer skip.

The top of the framework carries the elevating unit or digger elevator, mounted on wheels and movable back and forth longitudinally. The end can be raised and lowered and also swung in a complete horizontal circle. A separate four-cylinder, gasoline engine is used to drive this digger-elevator. It is fitted with power feed back and forth along the frame. The operator can quickly and easily adjust it to dig at any part of the material piles, on either side of the machine. The buckets, when worked to full capacity, will elevate about ¾ cubic yards per minute.

The buckets never work closer than 3 or 4 inches from the ground. A man who can be trained to be careful, cleans up the material and shovels it into the buckets. The digger-elevator discharged into a measuring hopper, with a number of adjustable, graduated compartments that is moved along the frame by a cable. To begin, all compartments of the hopper except one, sufficient for about 6 to 9 batches, are filled with sand. Then the digger is swung to work on the stone pile. As the compartments of sand are emptied (one to a batch), they are refilled with stone. In this way the hoppers serve as a storage for one material while the digger is working on the other. The digger operates approximately, during the time required for three or four batches on sand and six to eight batches on stone.

The Stamp mixer loader is equipped with a forward and reverse traction mechanism, operated by a 25 h. p. 4-cylinder gasoline engine which also operates the left conveyor. It is also equipped with a 4-wheel steering device which makes it easy to turn corners at a small radius. The front section beyond the wheels, and the rear inclined section, can be easily disconnected for shipment. The main framework, with the digger-elevator, will occupy the length of a flat car.

The manufacturers claim that a mechanical loader will enable contractors to use larger mixers on roadwork, and that with material stored on the grade delays are eliminated, so that the mixer can be operated to full capacity 10 hours per day.



LOCATION AND OPERATION OF MIXER LOADER COMMANDING 32 x 87 FOOT SPACE BEHIND MIXER

HANDLING AND MEASURING AGGEGATE FROM SUB-GRADE PILES TO PAVING MIXTURE

WESTINGHOUSE STREET LAMPS

Circular 7A-C-2 has been issued by the Westinghouse Electric & Manufacturing Company, eorge Cutter Works, South Bend, Indiana, describing and illustrating the Westinghouse Luxsolite fixtures for street lighting. Style numbers and data on these fixtures, together with prices, are given in this circular.

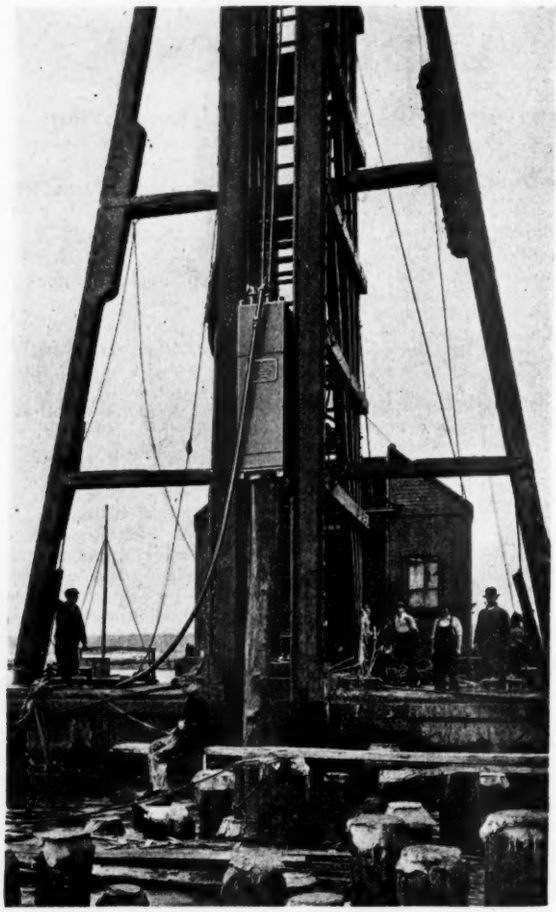
The C. I. type (cast iron) Luxsolite fixtures are used with Westinghouse Mazda C lamps in the same manner as former types of Luxsolite fixtures for the righting of residential streets, parks, and other large outdoor spaces. Their very rugged construction makes them especially useful for the hard service required of street lighting fixtures—the cast iron casings cannot be dented. For districts requiring an extraordinarily sturdy and compact unit the cast iron fixture, by reason of its additional ruggedness and weight, is especially valuable.

The weight of the Type C I Luxsolite fixtures has been kept well under that of the standard enclosed arc lamps formerly used, so that no difficulty may be experienced in the use of the same line equipment with the new fixtures.

A refractor of the skirted type is recommended where distribution of the nature given by refracting glassware is of advantage. The skirted refractor gives a good distribution of the light close to the horizontal angles and at the same time throws sufficient light on the street beneath the lamp ot prevent the dim appearance produced by using the bowl-type refractor. The diffusing skirt cuts off the direct rays of the high intensity filaments, which are exposed when used with the band-type refractor. The skirted refractor thus gives the advantages of both the bowl-type and band-type refractor with comparatively little reduction in candlepower at angles close to the horizontal, or in the overall efficiency of the complete unit.

Engineering

MAR 14 19



DRIVING A 70-FOOT PILE TO FULL PENETRATION IN 10 MINUTES WITH DOUBLE ACTING STEAM HAMMER

McKIERNAN-TERRY STEAM HAMMERS

Bulletin No. 28 of the McKiernan-Terry Drill Company gives drawings and specifications of eight sizes of double acting steam hammers with net weights of 145 to 13,100 pounds and extreme length of 95 inches. They have strokes of 3¾ inches to 18 inches, delivering blows of 98 to 22,086 net pounds energy, and requiring boilers of from 10 to 60 h. p. or from 75 to 600 cubic feet of compressed air per minute. They will drive round piling to a penetration of from 6 to 60 feet in average material.

These hammers were the first double acting pile hammers commercially introduced in America, and are especially advantageous for driving sheet piles and batter piles and for extraordinarily hard driving. The smallest size, used for driving light sheet piles, can be handled without tackle and the larger sizes are used in a reverse position for pulling sheet piles which are thus very effectively removed under difficult conditions.

Some of the largest piles ever driven, consisting of two timbers bolted together, making a combined cross section of 15½ x 15½ inches, were 70 feet long and were driven at the rate of two per day penetrating 25 feet through gravel in the bed of the Thames river, London, where a five-ton drop hammer required four days for driving the same piles.

The accompanying illustrations shows one of these hammers driving 48 70-foot piles with 18-inch butts, in one day without jetting and without injury, where similar piles of the same job, driven by 6,500-pound drop hammers and hydraulic jets, were driven much more slowly and were badly injured by driving. The bulletin contains numerous pictures and data of pile hammers installed on different jobs which are briefly described.

INDUSTRIAL NOTES

The Combustion Engineering Corporation, New York City, has opened a branch office at 521 Candler building, Atlanta, Ga., in charge of A. A. Hutchinson.

The name of the Whiting Foundry Equipment Co. has been changed to the Whiting Corporation. The general offices and works of this corporation are located at Harvey, Ill., where they manufacture electric traveling cranes and complete foundry plants.

The Lake Shore Motor Bus Corporation, a holding company, has taken over the business of the American Motor Bus Corporation and the Chicago Motor Bus Company.

Joseph E. Nelson & Sons announce the appointment of J. B. French, as chief engineer of the firm.

PERSONALS

Mills, Thornton A., has accepted a position as civil engineer, Department of Public Works, Manila, P. I.

Letts, Joseph C., has been appointed construction engineer in the U. S. Public Health Service, with headquarters at Waukesha, Wis.

Garvin, Samuel H., has been appointed city engineer of Bowling Green, Ky.

Yorath, C. J., has been appointed commissioner of public works and utilities at Edmonton, Alberta.

Pearce, W. G., has been appointed assistant designing engineer of the sewer section, Department of Public Works, Toronto.

McKinnon, Ronald, has been appointed city engineer of Sydney, N. S., to succeed N. K. Hay, who resigned.

Goebel, Norman J., has been appointed engineer for the Board of Water Commissioners, to succeed W. G. Worden, who resigned.

McClenahan, Robert A., has been appointed city engineer of Astoria, Ore.

Shaffer, Philip H., has been appointed engineer of Somerset county, Pa.

Parks, O. E., has been appointed superintendent of highways, sewers and water works of Westfield, Mass.

Stevenson, D. W., has been appointed to the Florida State Road Department to succeed Edward Scott.

Tee, Alfred S., for 14 years city engineer of Astoria, Ore., has resigned.

Cade, K. C., has resigned as county engineer of Dickerson county, Texas.

Johnson, W. D., has recently been appointed engineer of Black Hawk county, Ia.

Atkins, Dudley, Jr., has been appointed county engineer of Osage county, Kan.

Tutewiler, Charles A., has resigned as member of the Florida State Road Department.

Dobbin, Jay H., has been appointed to the Oregon State Highway Commission.

Kennedy, J. E., formerly city engineer of Vancouver, B. C., Canada, died recently at Owen Sound, Ont.

Dilling, A. W., has been appointed chief engineer and S. T. Smetters maintenance engineer of the Sanitary District of Chicago.

Kennedy, C. H., has been appointed general sales manager of the Kennedy Valve Co., Elmira, N. Y.

Hendry, W. A., of Halifax, N. S., has been appointed chief engineer to the Provincial Highways Board of Nova Scotia.

Wright, C. R., is now assistant engineer for the Port of Grays Harbor at Aberdeen, Wash., in charge of all harbor improvement work under the direction of C. A. Strong of Tacoma, Wash.

McFarland, Robert, has been appointed superintendent of water works, Brandon, Manitoba, Canada.

Blanchard, Arthur H., consulting highway and transport engineer of Ann Arbor, Mich., has been engaged by the city of Colorado Springs in connection with its $1,200,000 paving program.